

mip-nai_dhcp_thread

* File: mip_nai_dhcp_thread

Sent: Tuesday, June 01, 1999 6:14 PM
To: 'Charles Perkins'
Cc: 'Patrice Calhoun'; 'thuel@lucent.com'; 'ramjee@lucent.com'
Subject: RE: [MOBILE-IP] M-IP + NAI + DHCP??

Hi Charlie,

Here are some suggested changes to the NAI draft that would address the concerns we've expressed. I've kept these suggestions to a minimum and have shown them in caps.

The more I think about this, the more I believe that the HDAF idea should be in a separate draft and this draft should only focus on the NAI extension. Dynamic home addressing is a problem in its own right, whether or not NAI is used. I would suggest writing a separate follow-up draft focusing on how to do dynamic home addressing with NAI (grounded on a solid treatment of the problem of dynamic home addressing without NAI). Do you have a strong reason for keeping HDAF in this draft?

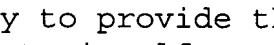
Regards,
Sandy

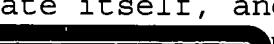
In the Abstract...

AAA servers today identify clients by using the Network Access Identifier (NAI). WE SUGGEST THE USE OF NAI FOR IDENTIFYING MOBILE NODES, INSTEAD OF THE CONVENTIONAL USE OF IP ADDRESSES FOR BOTH IDENTIFYING AND LOCATING A MOBILE NODE. Our proposal defines a way for the mobile node to include the NAI along with the Mobile IP Registration Request. IT ALSO SUGGESTS AN APPROACH TO DYNAMIC HOME ADDRESSING WHICH USES OUR EXTENDED MOBILE IP REGISTRATION REQUEST.

In the Introduction

....AAA servers today identify clients by using the Network Access Identifier (NAI) [1]. WE SUGGEST THE USE OF NAI FOR IDENTIFYING MOBILE NODES, INSTEAD OF THE CONVENTIONAL USE OF IP ADDRESSES FOR BOTH IDENTIFYING AND LOCATING A MOBILE NODE.

This document specifies the Mobile Node NAI extension to the Mobile IP Registration Request [9] message from the mobile node. Since the NAI is typically used to uniquely identify the mobile node, the mobile node's home address is not always necessary to provide that function. Thus, it is possible for a mobile node to authenticate itself, and be authorized for connection to the foreign domain, without  me address.

HOWEVER, ONCE AUTHENTICATED,  TO COMPLETE ITS MOBILE IP RE²  EXHIBIT  UST HAVE A HOME ADDRESS IN ORDER  MOBILE NODE'S HOME AGENT MUST



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CREATE A TUNNEL ENTRY CONTAINING THE MOBILE NODE'S HOME ADDRESS TO CARE OF ADDRESS BINDING. TO ADDRESS THIS REQUIREMENT, THIS DRAFT ILLUSTRATES AN APPROACH TO DYNAMIC HOME ADDRESSING BASED ON A "new function named the Home Domain Allocation Function (HDAF)". HDAF USES REGISTRATION MESSAGES WITH THE NAI EXTENSION TO TRIGGER THE ACQUISITION OF A HOME ADDRESS. A message containing the Mobile Node NAI extension MAY have the Home Address field in the Registration Request set to zero (0) to request that one be assigned.

At the end of the Introduction section...

THIS DOCUMENT DOES NOT SPECIFY THE DETAILS OF HDAF OPERATION NOR DOES IT ADVOCATE HDAF AS THE ONLY SOLUTION FOR DYNAMIC HOME ADDRESSING WITH OR WITHOUT THE NAI EXTENSION. THERE ARE SEVERAL ARCHITECTURAL AND IMPLEMENTATION ISSUES THAT NEED TO BE RESOLVED PRIOR TO SPECIFYING A COMPLETE SYSTEM SOLUTION.

On Friday, May 28, 1999 11:20 AM, John Williams Floroiu
[SMTP:floroiu@FOKUS.GMD.DE] wrote:

> Hello,

>

> Probably I missed something, but maybe somebody could light me, because
> as soon as a MN has acquired a CoA and has authenticated itself with the
> HA (or a "proxy") using NAI, then a bi-directional tunnel between the MN
> and HA can be established, and the DHCP messages can freely travel
> across this tunnel. So, what would be the need for MIP or NAI to
> understand or provide extensions for DHCP ? (The DHCP client running on
> the MN is located at an upper layer within the protocol stack). Where am
> I wrong ?

>

> John.From: Charles Perkins [charles.perkins@eng.sun.com]

Sent: Tuesday, May 25, 1999 3:44 PM

To: Sandy Thuel

Cc: MOBILE-IP@standards.nortelnetworks.com

Subject: Re: [MOBILE-IP] M-IP + NAI + DHCP??

Sandy,

> We see benefits in using the NAI and in general, like the idea.
> However, we also see several problems in implementing it, specifically
> when using DHCP for the dynamic home addressing aspect of the
> proposal.

The NAI draft is intentionally not dependent on DHCP. In fact, one can easily implement dynamic address allocation with some sort of pool maintained by the Home Agent.

> The proposal makes no
> mention of DHCP but since it is the natural choice for dynamic home
>addressing, has anyone has taken a close look at how to implement this
>NAI draft using DHCP?

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What if DHCP is a private matter between the Home Agent and the DHCP Server, and the Home Agent thereby serves as a "proxy" for the Mobile Node?

> Hint: a particularly challenging situation arises when trying to power up the MH in a foreign domain (with no home address).

Does the NAI draft need specific language to allow a Mobile Node to send a Registration Request with (source IP address == zero) in the IP header?

Regards,

Charlie P.

From: Pete McCann [mccap@research.bell-labs.com]

Sent: Tuesday, May 25, 1999 4:37 PM

To: thuel@bell-labs.com

Subject: [MOBILE-IP] M-IP + NAI + DHCP??

Sandy Thuel <thuel@BELL-LABS.COM> (ST) writes:

ST> Hint: a particularly challenging situation arises when trying to power up the MH in a foreign domain (with no home address).

Sandy,

The idea is that the registration request would be passed through a AAA infrastructure to a home network. There the address could be assigned by either a DHCP server or the home agent itself - this particular draft doesn't mention how, it just defines the extensions in the registration request/response.

Having an NAI is critical to properly routing the request through the AAA infrastructure and integrating with IP roaming.

-Pete

From: Pete McCann [mccap@research.bell-labs.com]

Sent: Tuesday, May 25, 1999 7:03 PM

To: thuel@bell-labs.com

Subject: RE: [MOBILE-IP] M-IP + NAI + DHCP??

Sandy Thuel <thuel@bell-labs.com> (ST) writes:

ST> We understand your intent and believe it is a good one! We just want to examine a complete solution that uses DHCP and convince ourselves that it'll work. Unfortunately, the complete solution doesn't appear to be trivial.

Maybe not trivial, but it seems straightforward: the HA or the home AAA server speaks DHCP to request an address, and maintains the lease on that address for the life of the session. If the user's profile (indexed by NAI) indicates that a local HA/address should be assigned, then the visited network speaks DHCP

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*and maintains the address.

Are there some specific problems you see with using DHCP in this environment? In these scenarios, the client itself *does not* use DHCP, so maybe that's the issue that you are worried about. The client must use Mobile IP to register, even in its home network.

-Pete

From: Charles Perkins [charles.perkins@eng.sun.com]
Sent: Tuesday, May 25, 1999 7:51 PM
To: Sandy Thuel
Cc: pcalhoun@eng.sun.com
Subject: RE: [MOBILE-IP] M-IP + NAI + DHCP??

Hello Sandy,

> > The NAI draft is intentionally not dependent on DHCP. In fact, one
> > can easily implement dynamic address allocation with some sort of
> > pool maintained by the Home Agent.
>

> Thanks for the clarification. In addition to other options, we
> considered this idea for dynamic address allocation. One could make
> it work but it's not so straightforward. For instance, say you use
> this approach to allow the mobile host to acquire a home address that
> it can use to complete its Mobile-IP registration. How does the host
> acquire the rest of its home configuration state (e.g., its name
> servers, netmask, etc.)? Is this home address treated as a leased or a
> fixed address? If leased, who sends the lease renewals to prevent
> expirations? Or do you treat the home address given by the Home Agent
> as a temporary address to enable the registration to complete and then
> launch a DHCP lease renewal to acquire a leased home address and any
> other desired DHCP options? It's not clear what is the best solution.

I'm reluctant to start down the road of equipping Mobile IP with all manner of DHCP-style options. I hope it isn't necessary to get finished with Last Call for the NAI draft. On the other hand, I recognize the value of creating a complete system solution in order to be able to sell products. I just hope that the entire specification for the creation doesn't have to go into this draft.

> > What if DHCP is a private matter between the Home Agent and the DHCP
> > Server, and the Home Agent thereby serves as a "proxy"
> > for the Mobile Node?
>
>

> Understood. This is exactly a model we've looked at, where something
> like a DHCP proxy agent is colocated with the Home Agent. This proxy
> agent could both acquire and maintain a leased home address on behalf
> of a mobile host while it is in a foreign network. The main issue
> here is downloading all of the DHCP configuration state onto the
> mobile host (not just its home address). Do we rely on the Home Agent

> > who triggered the proxy to send all the configuration state back to
> the mobile host in extended registration ack messages? Is this a good
> idea? This seems to be where the transparency of the dynamic addressing
protocol breaks down.

>From what I understand, this is the same question as before.

Both variations stem from the fact that IP addresses don't occur in a vacuum, and are associated with possibly many other parameters. Thus, there is never any real transparency in an absolute sense. This is true even for DHCP itself. To see how transparency fails in another way, consider how/whether a mobile node should be able to get multiple home IP addresses.

> > Does the NAI draft need specific language to allow a Mobile Node to
> > send a Registration Request with (source IP address == zero) in the
> > IP header?

>

> The NAI draft already states that by setting the Home Address field in
> the Registration Request to zero, the mobile host is requesting that a
> home address be assigned. I believe this to be sufficient. In fact,
> is it possible that by requiring the IP source address to be set to
> zero some other agent in the access network may be confused by
> interpreting it as a different cue? (e.g., a FA may think a host is
> requesting a COA even if it has a CCOA)

I'm happy if everyone else is happy!

A good thing to do would be to get the NAI to Proposed Standard, if it's not broken. Then we would get the experience needed to figure out how to do the system design.

Regards,

Charlie P.

From: Sandy Thuel [thuel@bell-labs.com]
Sent: Wednesday, May 26, 1999 5:01 PM
To: 'Charles Perkins'
Cc: MOBILE-IP@standards.nortelnetworks.com; 'thuel@lucent.com'
Subject: RE: [MOBILE-IP] M-IP + NAI + DHCP??

Hi Charlie,

> > CP> The NAI draft is intentionally not dependent on DHCP. In fact,
> > CP> one can easily implement dynamic address allocation with some
> > CP> sort of pool maintained by the Home Agent.
>
> ST> Thanks for the clarification. In addition to other options, we
> ST> considered this idea for dynamic address allocation. One could
> ST> make it work but it's not so straightforward. For instance, say
> ST> you use this approach to allow the mobile host to acquire a home
> ST> address that it can use to complete its Mobile-IP registration.
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> ST> treated as a leased or a fixed address? If leased, who sends the
 > ST> lease renewals to prevent expirations? Or do you treat the home
 > ST> address given by the Home Agent as a temporary address to enable
 > ST> the registration to complete and then launch a DHCP lease renewal
 > ST> to acquire a leased home address and any other desired DHCP
 > ST> options? It's not clear what is the best solution.
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CP> I'm reluctant to start down the road of equipping Mobile IP with all
 CP> manner of DHCP-style options. I hope it isn't necessary to get
 CP> finished with Last Call for the NAI draft. On the other hand, I
 CP> recognize the value of creating a complete system solution in order
 CP> to be able to sell products. I just hope that the entire
 CP> specification for the creation doesn't have to go into this draft.

I understand your position. So the issue here is whether or not the NAI draft really needs to consider all/any of these issues. As I see it, there are two aspects to the draft: 1) the idea of using the NAI as the primary identifier for the mobile host; and 2) the idea of using Mobile-IP transactions and HDAF to indirectly trigger dynamic home addressing transactions in the access network.

The first point is perfectly fine. The second one, on the other hand is subject to controversy because it impacts the contents of Registration Replies and the semantics of Registration requests. It raises a key question: Can we camouflage dynamic addressing transactions in a Mobile-IP outfit in a manner that is efficient and independent of the addressing protocol used?

As far as the NAI draft goes, I believe that the two aspects of the draft deal with orthogonal issues but I'm afraid that they may not be viewed that way. To dispel such concerns, I'd be more comfortable with a clearer separation of the two aspects of the draft, an explicit statement that poses the HDAF idea as one of several possible solutions for dynamic home addressing (which BTW, uses NAI as well), and an acknowledgement that there are architectural and implementation issues that need to be worked out in order to seek a complete system solution.

The wrong message I would like to avoid sending is that HDAF is *the* way to use NAI and Mobile-IP for dynamic home addressing.

> > CP> What if DHCP is a private matter between the Home Agent and the
 > > CP> DHCP Server, and the Home Agent thereby serves as a "proxy"
 > > CP> for the Mobile Node?
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 > >

> ST> Understood. This is exactly a model we've looked at, where
 > ST> something like a DHCP proxy agent is colocated with the Home
 > ST> Agent. This proxy agent could both acquire and maintain a leased
 > ST> home address on behalf of a mobile host while it is in a foreign
 > ST> network. The main issue here is downloading all of the DHCP
 > ST> configuration state onto the mobile host (not just its home
 > ST> address). Do we rely on the Home Agent who triggered the proxy to
 > ST> send all the configuration state back to the mobile host in
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CP> From what I understand, this is the same question as before.
CP> Both variations stem from the fact that IP addresses don't occur in
CP> a vacuum, and are associated with possibly many other parameters.
CP> Thus, there is never any real transparency in an absolute sense.
CP> This is true even for DHCP itself. To see how transparency fails in
CP> another way, consider how/whether a mobile node should be able to
CP> get multiple home IP addresses.

>

You're right. So we agree that transparency can only be achieved in a limited sense.

>> CP> Does the NAI draft need specific language to allow a Mobile Node
>> CP> to send a Registration Request with (source IP address == zero)
>> CP> in the IP header?

>>

> ST> The NAI draft already states that by setting the Home Address
> ST> field in the Registration Request to zero, the mobile host is
> ST> requesting that a home address be assigned. I believe this to be
> ST> sufficient. In fact, is it possible that by requiring the IP
> ST> source address to be set to zero some other agent in the access
> ST> network may be confused by interpreting it as a different cue?
> ST> (e.g., a FA may think a host is requesting a COA even if it has a
> ST> CCOA)

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CP> I'm happy if everyone else is happy!

CP>

CP> A good thing to do would be to get the NAI to Proposed Standard, if
CP> it's not broken. Then we would get the experience needed to figure
CP> out how to do the system design.

I agree with this goal. My only reservations about the NAI draft are to consider the changes I suggested above in order to avoid confusion.

Regards,

Sandy

From: Sandy Thuel [thuel@bell-labs.com]

Sent: Wednesday, May 26, 1999 5:09 PM

To: 'mccap@research.bell-labs.com'

Cc: MOBILE-IP@standards.nortelnetworks.com; 'thuel@lucent.com'

Subject: RE: [MOBILE-IP] M-IP + NAI + DHCP??

Pete,

> ST> We understand your intent and believe it is a good one! We just want to
> ST> examine a complete solution that uses DHCP and convince ourselves > ST>
that it'll work. Unfortunately, the complete solution doesn't appear to be >
ST> trivial.

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PM> on that address for the life of the session. If the user's profile > PM> (indexed by NAI) indicates that a local HA/address should be assigned, > PM> then the visited network speaks DHCP and maintains the address.

>

> PM> Are there some specific problems you see with using DHCP in this > PM> environment? In these scenarios, the client itself *does not* use > PM> DHCP, so maybe that's the issue that you are worried about. The > PM> client must use Mobile IP to register, even in its home network.

>

Just to set the record straight, the model you seem to be suggesting is one where the mobile host never runs a DHCP client but an agent in the access network (such as the HA or the home AAA server) both: a) acquires a home address for a mobile host and b) renews the address lease on its behalf. Since the only mechanism for acquiring DHCP-allocated addresses is through Mobile-IP registrations, the mobile host must always send registrations whether it's in its home or in a foreign network.

This model sounds reasonable but it raises some issues. The main one is getting all the DHCP configuration state (home address + options) to the mobile host. Mediating DHCP transactions through a Mobile-IP agent (i.e., the HA in this case) may require many changes to that agent so that it can speak DHCP in the back end and piggyback DHCP state on extended Mobile-IP messages on the front-end (that which is exposed to the mobile host). Second, in order to preserve the soft-state philosophy of DHCP, the DHCP client state machine that was spawned on the network (in the AAA server or the HA, as per this model) should have an associated lifetime and require renewals from either the HA or the mobile host. Third, if a mobile host requires two dynamically allocated addresses, a colocated COA and a home address, should both addresses be indirectly acquired (and "proxied") through Mobile-IP registrations? Only the home address?

Clearly, there are workarounds/solutions for each of these points but there's also a non-negligible cost that we need to seriously look at.

My belief is that the major cost we incur if we want to hide the dynamic address allocation protocol behind a Mobile-IP front end, regardless of whether that protocol is DHCP or any other one is that the mediating Mobile-IP agent for the addressing protocol becomes coupled to the addressing protocol. This coupling introduces an inter-protocol evolution dependency problem to ensure that the mediating Mobile-IP agent exposes to the mobile host the functionality and state that the addressing protocol would have exposed through a direct communication with the mobile host. We may argue that only a small subset of the functionality and state of the addressing protocol really needs to be exposed but doesn't this needlessly erode the benefits of having a dynamic addressing protocol in the first place?

Regards,

Sandy

P.S.: I apologize if anyone gets a duplicate of this message. I am resending due to a mailing problem.

From: Pete McCann [mccap@research.bell-labs.com]

Sent: Wednesday, May 26, 1999 7:33 PM

To: thuel@bell-labs.com

Cc: MOBILE-IP@standards.nortelnetworks.com

Subject: Re: [MOBILE-IP] M-IP + NAI + DHCP??

Sandy Thuel <thuel@BELL-LABS.COM> (ST) writes:

ST> My belief is that the major cost we incur if we want to hide the
ST> dynamic address allocation protocol behind a Mobile-IP front end,

Sandy,

I would just point out that historically, DHCP has not been used on wide area networks. The number of things that need configuring is typically smaller than on a LAN. PPP is most often used (I should say "overloaded") for this task, and it seems to me that the current Mobile IP NAI draft was written with this wide-area network deployment scenario in mind. It correctly lifts this out of the domain of the link-layer and into the IP layer.

However, if you think the extra options available in DHCP are important to support in this environment, there seem to be two possible options: 1) add DHCP extensions to Mobile IP, as Charles has suggested, or 2) add NAI and challenge/response to DHCP, and route requests through the AAA infrastructure as is currently proposed for Mobile IP. What are the costs and benefits of each? It seems that adding support for wide-area DHCP relay via AAA would really complicate the service provider infrastructure. Also, both protocols would need to be implemented on clients: Mobile IP would still be needed for mobility events, including inter-domain ones, because running DHCP on every mobility event doesn't make sense. It also seems to require two round-trip Internet traversals to accomplish an initial registration, unless even more (Mobile IP-specific) extensions can be added to DHCP.

It seems to me that the correct thing is for the necessary dynamic configuration options to be cautiously added to Mobile IP as it is determined that they are needed.

-Pete

From: Charles Perkins [charles.perkins@eng.sun.com]
Sent: Thursday, May 27, 1999 1:05 PM
To: Sandy Thuel
Cc: MOBILE-IP@standards.nortelnetworks.com
Subject: Re: [MOBILE-IP] M-IP + NAI + DHCP??

Hello Sandy,

>

> there are two aspects to the draft: 1) the idea of using the NAI as
>the primary identifier for the mobile host; and 2) the idea of using
>Mobile-IP transactions and HDAF to indirectly trigger dynamic home
>addressing transactions in the access network.

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> The first point is perfectly fine. The second one, on the other hand
> is subject to controversy because it impacts the contents of
> Registration Replies and the semantics of Registration requests. It

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> raises a key question: Can we camouflage dynamic addressing
 > transactions in a Mobile-IP outfit in a manner that is efficient and
 > independent of the addressing protocol used?

I don't think that camouflage is necessary. Keep in mind that all we are doing is providing for interoperability. If the mobile node gets an address, it should be able to use it. The routing prefix could be made known to the mobile node on the home network, and would not have changed. We are really trying to provide exactly what a mobile node would need to follow protocol, not what a mobile node would need to know all details about how to use the information obtained from the protocol.

> I'd be more comfortable with a
 > clearer separation of the two aspects of the draft, an explicit
 > statement that poses the HDAF idea as one of several possible
 > solutions for dynamic home addressing (which BTW, uses NAI as well),
 > and an acknowledgement that there are architectural and implementation
 > issues that need to be worked out in order to seek a complete system
 > solution.
 >
 > The wrong message I would like to avoid sending is that HDAF is *the*
 > way to use NAI and Mobile-IP for dynamic home addressing.

Can you propose some wording to that effect that we can include in a revised draft? It's already a sure bet that another revision is needed. All of the changes indicated so far are very simple (e.g., changing 130 to be 131 instead), but they are necessary. I view the clarification that you are requesting as also a simple matter, but one that has to be done right. Your help would be appreciated.

On the one hand, the HDAF is a purely fictitious entity. On the other hand, any solution I can think of can be considered to be an HDAF. So, I'm not worried about the HDAF as *the only* way to use NAI. In fact, one can advantageously use NAI and not use HDAF or any other dynamic home address facility at all.

Regards,
 Charlie P.

From: John Williams Floroiu [floroiu@fokus.gmd.de]
 Sent: Friday, May 28, 1999 11:20 AM
 To: MOBILE-IP@standards.nortelnetworks.com
 Cc: Charles Perkins; Sandy Thuel
 Subject: Re: M-IP + NAI + DHCP??

Hello,

Probably I missed something, but maybe somebody could light me, because as soon as a MN has acquired a CoA and has authenticated itself with the HA (or a "proxy") using NAI, then a bi-directional tunnel between the MN and HA can be established, and the DHCP messages can freely travel across this tunnel. So, what would be the need for MIP or NAI to understand or provide extensions for DHCP ? (The DHCP client running on the MN is located at an upper layer within

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: the protocol stack). Where am I wrong ?

John.

From: Sandy Thuel [thuel@bell-labs.com]
Sent: Tuesday, June 01, 1999 2:52 PM
To: 'floroiu@FOKUS.GMD.DE'; MOBILE-IP@standards.nortelnetworks.com
Subject: RE: [MOBILE-IP] M-IP + NAI + DHCP??

Hi John,

The problem is the following. NAI allows the HA to *authenticate* the host but what comes next? The HA must create a tunnel entry binding the mobile host's home address to its CoA. If the host doesn't have a home address at this point, you have to do something about it. This is where it gets tricky.

Note you can't run DHCP over the tunnel because there is not tunnel yet - of course, DHCP transactions can run as usual *after* the tunnel is in place. So there are several ways it can get a home address.

1. The HA manages a pool of IP addresses in its home network that it can allocate to hosts that try to register with no home address

Pro's: The HA need not speak to DHCP agents.

Con's: The HA must either re-invent all DHCP functionality or a limited portion of it (e.g., throwing away soft-state? DHCP options?). Splitting of the IP address space across the HA and DHCP may also be an issue.

2. The Mobile-IP client on the host is statically configured with several home addresses it can try using in its registration

Pro's: no changes needed to the HA nor to DHCP

Con's: client must go through a registration trial-and-error phase which may take a long time and may still fail. The static configuration requirement of the client is also undesirable.

3. The HA knows how to speak to one or more DHCP servers in its network so it serves as a proxy for the acquisition of an address on behalf of the mobile host.

Pro's: DHCP does what it knows best and the HA lets it do its job

Con's: the HA must be changed to include DHCP proxy functionality.

After the home address is acquired, who owns the DHCP client state machine for lease renewals? The proxy on the HA? The mobile host? There are tradeoffs in each choice.

These solutions are just intended to show that that the solution is not clearcut. Which elements need to be changed and the extent of the changes are at stake.

Regards,
Sandy

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From: pcalhoun@eng.sun.com [Pat.Calhoun@Eng.Sun.COM]
 Sent: Tuesday, June 01, 1999 3:28 PM
 To: thuel@bell-labs.com
 Cc: MOBILE-IP@standards.nortelnetworks.com
 Subject: Re: [MOBILE-IP] M-IP + NAI + DHCP??

> Hi John,
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 > The problem is the following. NAI allows the HA to *authenticate*
 > the host but what comes next? The HA must create a tunnel entry
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 > doesn't have a home address at this point, you have to do something
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 > allocate to hosts that try to register with no home address
 > Pro's: The HA need not speak to DHCP agents.
 > Con's: The HA must either re-invent all DHCP functionality or a limited
 > portion of it (e.g., throwing away soft-state? DHCP options?).
 > Splitting
 > of the IP address space across the HA and DHCP may also be an issue.

Soft state is already part of the home agent, since we need to time out
 expired tunnels. Therefore I do not see a CON. BTW, the functionality here is
 much simpler than DHCP. We are only providing an IP address, not everything
 else that DHCP needs to worry about.

>
 > 2. The Mobile-IP client on the host is statically configured with several
 > home addresses it can try using in its registration
 > Pro's: no changes needed to the HA nor to DHCP
 > Con's: client must go through a registration trial-and-error phase which
 > may take a long time and may still fail. The static
 > configuration requirement
 > of the client is also undesirable.

Does not scale very well for IPv4 networks. We are seriously worried about
 wasting IP addresses to begin with, which lead to this Mobile-IP add-on.

>
 > 3. The HA knows how to speak to one or more DHCP servers in its
 > network so it serves as a proxy for the acquisition of an address on
 > behalf of the mobile host.
 > Pro's: DHCP does what it knows best and the HA lets it do its job
 > Con's: the HA must be changed to include DHCP proxy functionality.
 > After the home address is acquired, who owns the DHCP client
 > state machine for lease renewals? The proxy on the HA? The mobile
 > host? There are tradeoffs in each choice.

I do not see how this is different from #1. This is purely an implementation issue whether one uses internal address pools, or DHCP.

PatC

>
>
> These solutions are just intended to show that that the solution is
> not clearcut. Which elements need to be changed and the extent of the
> changes are at stake.
>
> Regards,
> Sandy
>
> On Friday, May 28, 1999 11:20 AM, John Williams Floroiu
> [SMTP:floroiu@FOKUS.GMD.DE] wrote: > Hello,
> >
> > Probably I missed something, but maybe somebody could light me,
> > because as soon as a MN has acquired a CoA and has authenticated
> > itself with the HA (or a "proxy") using NAI, then a bi-directional
> > tunnel between the MN and HA can be established, and the DHCP
> > messages can freely travel accross this tunnel. So, what would be
> > the need for MIP or NAI to understand or provide extensions for DHCP
> > ? (The DHCP client running on the MN is located at an upper layer
> > within the protocol stack). Where am I wrong ?
> >
> > John.

From: Ramachandran Ramjee [ramjee@dnrc.bell-labs.com]
Sent: Tuesday, June 01, 1999 6:54 PM
To: MOBILE-IP@standards.nortelnetworks.com
Subject: Re: [MOBILE-IP] M-IP + NAI + DHCP??

Hi Pat,

"pcalhoun@eng.sun.com" wrote:

> > Sandy wrote:
> > 1. The HA manages a pool of IP addresses in its home network that it can
> > allocate to hosts that try to register with no home address
> > Pro's: The HA need not speak to DHCP agents.
> > Con's: The HA must either re-invent all DHCP functionality or a limited
> > portion of it (e.g., throwing away soft-state? DHCP options?).
> > Splitting
> > of the IP address space across the HA and DHCP may also be an issue.
>
> Soft state is already part of the home agent, since we need to time
> out expired tunnels. Therefore I do not see a CON. BTW, the
> functionality here is much simpler than DHCP. We are only providing an
> IP address, not everything else that DHCP needs to worry about.
>

I think tying the Dynamic IP address soft-state to the Mobile-IP tunnel soft-

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state in the HA creates its own set of problems.

For example, consider the case when the mobile host powers up in the foreign domain, acquires its home address through Mobile-IP, and then moves home. In this case, the tunnel at the HA no longer exists! Do you still maintain the Dynamic IP address soft-state at the HA or do you somehow pass this soft-state back to a DHCP

server? If you maintain the soft-state at the HA, will that be refreshed by Mobile-ip registration renewals by the mobile host even while at home - if so, will the renewal frequencies be different (DHCP renewals are typically on the order of hours while Mobile-IP renewals are on the order of minutes)?

Note that I appreciate the need for getting an IP address dynamically assigned through a Mobile-IP registration. I just think that there are a lot of issues to be considered here.

On the other hand, I think we all agree that NAI is a good thing. While NAI may be essential for dynamic address assignment, that is not its ONLY use. So why not shoot for two drafts, one just proposing the NAI extension and one detailing a way for getting an IP address assigned dynamically using Mobile-IP (the HDAF aspect of the current NAI draft)?

Cheers,
Ram

From: Sandy Thuel [thuel@bell-labs.com]
Sent: Tuesday, June 01, 1999 6:14 PM
To: 'Charles Perkins'
Cc: 'Patrice Calhoun'; 'thuel@lucent.com'; 'ramjee@lucent.com'
Subject: RE: [MOBILE-IP] M-IP + NAI + DHCP??

Hi Charlie,

Here are some suggested changes to the NAI draft that would address the concerns we've expressed. I've kept these suggestions to a minimum and have shown them in caps.

The more I think about this, the more I believe that the HDAF idea should be in a separate draft and this draft should only focus on the NAI extension. Dynamic home addressing is a problem in its own right, whether or not NAI is used. I would suggest writing a separate follow-up draft focusing on how to do dynamic home addressing with NAI (grounded on a solid treatment of the problem of dynamic home addressing without NAI). Do you have a strong reason for keeping HDAF in this draft?

Regards,
Sandy

mip_nai_dhcp_thread

In the Abstract...

AAA servers today identify clients by using the Network Access Identifier (NAI). WE SUGGEST THE USE OF NAI FOR IDENTIFYING MOBILE NODES, INSTEAD OF THE CONVENTIONAL USE OF IP ADDRESSES FOR BOTH IDENTIFYING AND LOCATING A MOBILE NODE. Our proposal defines a way for the mobile node to include the NAI along with the Mobile IP Registration Request. IT ALSO SUGGESTS AN APPROACH TO DYNAMIC HOME ADDRESSING WHICH USES OUR EXTENDED MOBILE IP REGISTRATION REQUEST.

In the Introduction...

....AAA servers today identify clients by using the Network Access Identifier (NAI). [1]. WE SUGGEST THE USE OF NAI FOR IDENTIFYING MOBILE NODES, INSTEAD OF THE CONVENTIONAL USE OF IP ADDRESSES FOR BOTH IDENTIFYING AND LOCATING A MOBILE NODE.

This document specifies the Mobile Node NAI extension to the Mobile IP Registration Request [9] message from the mobile node. Since the NAI is typically used to uniquely identify the mobile node, the mobile node's home address is not always necessary to provide that function. Thus, it is possible for a mobile node to authenticate itself, and be authorized for connection to the foreign domain, without even having a home address.

HOWEVER, ONCE AUTHENTICATED, A MOBILE NODE MUST HAVE A HOME ADDRESS IN ORDER TO COMPLETE ITS MOBILE IP REGISTRATION. THE MOBILE NODE'S HOME AGENT MUST CREATE A TUNNEL ENTRY CONTAINING THE MOBILE NODE'S HOME ADDRESS TO CARE OF ADDRESS BINDING. TO ADDRESS THIS REQUIREMENT, THIS DRAFT ILLUSTRATES AN APPROACH TO DYNAMIC HOME ADDRESSING BASED ON A "new function named the Home Domain Allocation Function (HDAF)". HDAF USES REGISTRATION MESSAGES WITH THE NAI EXTENSION TO TRIGGER THE ACQUISITION OF A HOME ADDRESS. A message containing the Mobile Node NAI extension MAY have the Home Address field in the Registration Request set to zero (0) to request that one be assigned.

At the end of the Introduction section...

THIS DOCUMENT DOES NOT SPECIFY THE DETAILS OF HDAF OPERATION NOR DOES IT ADVOCATE HDAF AS THE ONLY SOLUTION FOR DYNAMIC HOME ADDRESSING WITH OR WITHOUT THE NAI EXTENSION. THERE ARE SEVERAL ARCHITECTURAL AND IMPLEMENTATION ISSUES THAT NEED TO BE RESOLVED PRIOR TO SPECIFYING A COMPLETE SYSTEM SOLUTION.

From: Sandy Thuel [thuel@bell-labs.com]

Sent: Thursday, June 03, 1999 11:52 AM

To: 'Pete McCann'

Cc: Laporta, Thomas F (Thomas); Sinclair, Lynne M (Lynne); Hiller, Tom L (Tom); 'Casati, Alessio (Alessio)'; Ramjee, Ramachandran (Ram); Thuel, Sandra R (Sandra); 'salga@dnrc.bell-labs.com'; 'kvaradhan@lucent.com'

Subject: [MOBILE-IP] M-IP + NAI + DHCP??

Hi Pete,

Since there seems to be a misconception that we are trying to stop the NAI draft, please allow me to get the record straight: "We have absolutely NO intention to stop the NAI draft." Our messages on the MobileIP mailing list have been fully supportive

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of the NAI extension.

However, we have voiced concerns regarding the HDAF portion of the draft. This is a secondary issue brought out in the draft and it unfortunately opens a can of worms that is full of holes. So the message we've been conveying to the community is that either we:

- a) leave the HDAF discussion out of the draft completely and chalk this issue up as a work item for one of the working groups, as Pat Calhoun has suggested or
- b) edit the HDAF text to pose it as *one* possible approach to dynamic home addressing with NAI, acknowledging that a complete solution still needs to be worked on.

My fears with the current draft are that people may get the wrong impression that HDAF is the only way to do dynamic addressing with NAI or that HDAF is a completely hashed out solution.

Judging by the lastest email exchanges, it appears as though we are converging to an acceptable solution that will address our concerns.

I hope this clarifies our position.

Regards,

Sandy

From: Pete McCann [mccap@research.bell-labs.com]

Sent: Thursday, June 03, 1999 12:35 PM

To: thuel@bell-labs.com

Cc: Laporta, Thomas F (Thomas); Sinclair, Lynne M (Lynne); Hiller, Tom L (Tom); 'Casati, Alessio (Alessio)'; Ramjee, Ramachandran (Ram); Thuel, Sandra R (Sandra); 'salga@dnrc.bell-labs.com'; 'kvaradhan@lucent.com'
Subject: [MOBILE-IP] M-IP + NAI + DHCP??

Hi, Sandy,

I didn't think you were trying to stop the NAI draft and I understand your concerns with the HDAF - however I think they are misplaced. Part of the goal of the NAI draft is to support dynamic address configuration for mobile nodes. The NAI makes this possible because it provides a unique identifier even in the absence of a home address or home agent address, allowing these fields to be set to zero. The draft absolutely requires a discussion of an HDAF, but this is just an abstract entity that is not defined concretely in the draft. I don't think the draft gives the impression that the HDAF has in any way been completely decided or specified.

I think Tom and Lynne are understandably concerned because we really need this draft to go forward to make our CDMA architecture work, and dynamic address assignment (via Mobile IP) is a part of that architecture. I do not think text should be added to make the HDAF "one way of doing things" because it is by

definition a placeholder for something else and I think this is made clear by the draft.

Perhaps some wording could be added to strengthen this - we should discuss with Pat Calhoun.

The interaction that Ram raises with going home after an address has been assigned is a very valid one - we should discuss it more.

However, TR45.6 has decided that "going home" is really outside the scope of their architecture because while on a cellular wireless link, the mobile node is always roaming and connected to a FA, so the going home case is not so important to us at the moment. I suspect we need to add some requirements to the mobile node so that it keeps updating its "at-home" registration even after returning to the home network, if we want to support this feature. In any case it is a matter of interaction between the MN and its own home network which is outside the scope of 45.6, but certainly not the IETF.

In conclusion, let's talk with Pat about making some changes to the draft to emphasize that HDAF must be further specified elsewhere.

However, I hope we can keep the changes minor so as not to delay its passage.

-Pete

Sandy Thuel <thuel@bell-labs.com> (ST) writes:

ST> Hi Pete,

ST> Since there seems to be a misconception that we are trying to stop
ST> the NAI draft, please allow me to get the record straight:

ST> "We have absolutely NO intention to stop the NAI draft." Our
ST> messages on the MobileIP mailing list have been fully supportive of
ST> the NAI extension.

ST> However, we have voiced concerns regarding the HDAF portion of the
ST> draft. This is a secondary issue brought out in the draft and it
ST> unfortunately opens a can of worms that is full of holes. So the
ST> message we've been conveying to the community is that either we:
ST> a) leave the HDAF discussion out of the draft completely
ST> and chalk this issue up as a work item for one of the working groups,
ST> as Pat Calhoun has suggested or
ST> b) edit the HDAF text to pose it as *one* possible approach to dynamic
ST> home addressing with NAI, acknowledging that a complete
ST> solution still needs to be worked on.

ST> My fears with the current draft are that people may get the wrong
ST> impression that HDAF is the only way to do dynamic addressing with
ST> NAI or that HDAF is a completely hashed out solution.

ST> Judging by the lastest email exchanges, it appears as though we are
ST> converging to an acceptable solution that will address our concerns.

ST> I hope this clarifies our position.

ST> Regards,
ST> Sandy

ST> On Wednesday, June 02, 1999 7:01 AM, Casati, Alessio (Alessio)
[SMTP:acasati@lucent.com] wrote:

>> Folks,
>>
>> I please ask you not to shoot at the NAI draft anymore, since this is
>> fundamental, as it is, for the CDMA2000 MIP based architecture.
>>
>> I believe there's room for you to input your ideas without impacting
>> this draft.
>>
>> So, please, avoid doing so by making lucent appear to be willing to
>> stop the NAI draft as it is.
>>

>> Thanks

>>

>> Alessio

>>

>> > -----

>> > From: Ramjee, Ramachandran (Ram)
>> > Reply To: Ramjee, Ramachandran (Ram)
>> > Sent: 01 June 1999 23:54
>> > To: MOBILE-IP@STANDARDS.NORTELNETWORKS.COM
>> > Subject: Re: [MOBILE-IP] M-IP + NAI + DHCP??
>> >

>> > Hi Pat,

>> >

>> > "pcalhoun@eng.sun.com" wrote:

>> >

>> > > Sandy wrote:

>> > > 1. The HA manages a pool of IP addresses in its home network
>> > > that it

>> > can

>> > > allocate to hosts that try to register with no home address
>> > > Pro's: The HA need not speak to DHCP agents.

>> > > Con's: The HA must either re-invent all DHCP functionality

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>> > > portion of it (e.g., throwing away soft-state? DHCP options?).

>> > > Splitting

>> > > of the IP address space across the HA and DHCP may also

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>> > I think tying the Dynamic IP address soft-state to the Mobile-IP
>> > tunnel soft-state in the HA creates its own set of problems.
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>> > For example, consider the case when the mobile host powers up in
>> > the foreign domain, acquires its home address through Mobile-IP,
>> > and then moves home.
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>> > maintain the Dynamic IP address soft-state at the HA or do you
>> > somehow pass this soft-state back to a DHCP
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>> > refreshed by Mobile-ip registration renewals by the mobile host
>> > even while at home - if so, will the renewal frequencies be
>> > different (DHCP renewals are typically on the order of hours while
>> > Mobile-IP renewals are on the order of minutes)?
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>> > Note that I appreciate the need for getting an IP address
>> > dynamically assigned through a Mobile-IP registration. I just think
>> > that there are a lot of issues to be considered here.
>> > On the other hand, I think we all agree that NAI is a good thing.
>> > While NAI may be essential for dynamic address assignment, that is
>> > not its ONLY use. So why not shoot for two drafts, one just
>> > proposing the NAI extension and one detailing a way for getting an
>> > IP address assigned dynamically using Mobile-IP (the HDAF aspect of
>> > the current NAI draft)?
>> >
>> > Cheers,
>> > Ram
>> >

From: Tom Hiller [tom.hiller@lucent.com]
Sent: Thursday, June 03, 1999 2:36 PM
To: thuel@bell-labs.com
Cc: 'Pete McCann'; Laporta, Thomas F (Thomas); Sinclair, Lynne M (Lynne); Hiller, Tom L (Tom); 'Casati, Alessio (Alessio)'; Ramjee, Ramachandran (Ram); Thuel, Sandra R (Sandra); 'salga@dnrc.bell-labs.com'; 'kvaradhan@lucent.com'; gerlachc@lucent.com; rwelsch@lucent.com
Subject: Re: [MOBILE-IP] M-IP + NAI + DHCP??

Hi Sandy,

To offer some background, AAA as a central functionality for wireless data

seems to meet most needs, and has momentum. We have significant public support from Sprint and Airtouch, and TIA endorsement and support from all member carriers and vendors. Also, TIA plans Mobile IP Clients in CDMA phones and laptops attached to CDMA phones to only use the MIP RRQ method to obtain a dynamic home address.

HDAF should be clarified, if it rules out other valid approaches. For example IKE does not rule out other key management mechanisms, and we use that fact to support AAA as a means to distribute keys (and policy) to the FA, HA, and MN. As an internal Lucent discussion, would a sentence that says the mobile may use other methods, such as DHCP, to obtain a home address, resolve the concern?

Would a single at home registration, as Pete suggested, solve the problem of returning to the home network with a dynamic address?

Could we get a list together internally of all problems, discuss edits, and then talk to Calhoun and Perkins directly? This is what TIA has been doing for many months now to make this move forward.

Thanks,
Tom Hiller

Sandy Thuel wrote:

```
>
> Hi Pete,
>
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> the NAI draft, please allow me to get the record straight:
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mip_nai_dhcp_thread

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> > stop the NAI draft as it is..
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> > Thanks
> >
> > Alessio
> >
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> > > From: Ramjee, Ramachandran (Ram)
> > > Reply To: Ramjee, Ramachandran (Ram)
> > > Sent: 01 June 1999 23:54
> > > To: MOBILE-IP@STANDARDS.NORTELNETWORKS.COM
> > > Subject: Re: [MOBILE-IP] M-IP + NAI + DHCP??
> > >
> > > Hi Pat,
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> > > "pcalhoun@eng.sun.com" wrote:
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> > > IP address assigned dynamically using Mobile-IP (the HDAF aspect
> > > of the current NAI draft)?
> > >
> > > Cheers,
> > > Ram
> > >

From: Charles Perkins [Charles.Perkins@eng.sun.com]
Sent: Monday, June 07, 1999 6:58 PM
To: MOBILE-IP@standards.nortelnetworks.com
Subject: [MOBILE-IP] Revised NAI draft for Mobile IP

Hello Folks,

A revised draft, taking into account all the comments that were contributed during the Last Call process, has been submitted to the IETF Internet Draft directories. I have also made the draft available at the following URL:
<http://www.svrl.org/~charliep/txt/mobilenai/mip-nai.txt>

I hope that this takes care of all the concerns that have been expressed; if there are any further comments, please do not hesitate to let us know.

Regards,
Charlie P.

From: neil.brock@nokia.com
Sent: Wednesday, December 08, 1999 12:04 PM
To: thuel@bell-labs.com
Subject: RE: [MOBILE-IP] Home DHCP Address for MN

Sandy -

I saw your exchange on the mailing list. We've also just started working on a solution in this area. I'm interested in the information you mentioned and, if appropriate going forward, possibly collaborating on a draft.

- Neil

Neil A Brock, Nokia Internet Communications

5 Wayside Road, Burlington, MA 01803
Tel: +1.781.993.3869 Fax: +1.781.993.1910 Mob:+1.617.901.4143
neil.brock@nokia.com

-----Original Message-----

From: EXT Sandy Thuel [mailto:thuel@bell-labs.com]
Sent: Tuesday, December 07, 1999 10:14 AM
To: MOBILE-IP@STANDARDS.NORTELNETWORKS.COM
Subject: Re: [MOBILE-IP] Home DHCP Address for MN

Hi Cristian,

There are several ways to address this problem. The solution typically entails the help of Mobile IP to get the dynamically assigned home address for the roaming MN. For instance, when the MN sends a Mobile-IP registration to its HA (with a missing home address), the HA may trigger the acquisition of the home address via DHCP, then return the acquired address in its registration reply to the MN.

We are working on a document describing, in-depth, a solution to this problem. If you're interested in more information, please contact me directly.

- Sandy Thuel
Bell Labs, Lucent Technologies
thuel@lucent.com

On Tuesday, December 07, 1999 9:21 AM, Cristian Constantin
[SMTP:constantin@FOKUS.GMD.DE] wrote:
> Hello again!
>

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>> Any draft(s) which addresses the problem of having a roaming MN with a
> dynamically allocated IP Address in the HOME NETWORK?
>
> Anyone cares to give me some hints about how to solve this problem?
>
> Bye
> Cristian

1